

LISTING OF THE CLAIMS

This listing of the claims replaces all prior versions and listings of the claims in the Subject Application:

1 - 49. (*Canceled*)

50. (*Previously Presented*) A non-stoichiometric nanomaterial comprising two or more elements having a composition different than that required for stoichiometric bonding between the two or more elements, the composition represented by the formula:



wherein M comprises an element that can lower its free energy by chemically bonding with Z;

wherein Z comprises a chalcogen;

wherein n and p are integers greater than or equal to 1;

wherein $0.01 < x < 0.99$; and

wherein a value for a selected material property of the non-stoichiometric nanomaterial is greater than 10% different from a value for the same property for a stoichiometric form of the nanomaterial.

51. (*Previously Presented*) The non-stoichiometric nanomaterial of claim 50, wherein M is selected from the group consisting of: Ti, Mn, Fe, Ni, Zn, Cu, Sr, Y, Zr, Ta, W, Sc, V, Co, In, Li, Hf, Nb, Mo, Sn, Sb, Al, Ce, Pr, Be, Np, Pa, Gd, Dy, Os, Pt, Pd, Ag, Eu, Er, Yb, Ba, Ga, Cs, Na, K, Mg, Pm, Pr, Ni, Bi, Ti, Ir, Rb, Ca, La, Ac, Re, Hg, Cd, As, Th, Nd, Th, Md, and Au.

52. (*Previously Presented*) The non-stoichiometric nanomaterial of claim 50, wherein $0.02 < x < 0.98$.

53. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein $0.05 < x < 0.95$.

54. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the domain size of the material is less than 5 times the mean free path of electrons in the material.

55. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the domain size of the material is less than 100 nanometers.

56. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises two or more elements M that can lower their free energy by chemically bonding with Z.

57. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises more than one element Z.

58. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises more than one element M and more than one element Z.

59. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises a multimetallic nanopowder having an aspect ratio in a range of 1-25.

60. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises a polymetallic nanopowder comprising at least three metals and at least one chalcogen anion, and having a minimum dimension of less than 100 nm and an aspect ratio of 25 or less.

61. *(Previously Presented)* The non-stoichiometric nanomaterial of claim 50, wherein the nanomaterial comprises a nanofiller dispersed in a polymer matrix, thereby forming a nanostructured composite material.

62. *(Previously Presented)* A coating composition comprising the non-stoichiometric nanomaterial of claim 50.

63. *(Previously Presented)* A nanostructured composite material comprising:
a polymer matrix; and
a nanofiller dispersed in the polymer matrix;
wherein the nanofiller comprises a non-stoichiometric nanomaterial comprising two or more elements having a composition different than that required for stoichiometric bonding between the two or more elements, the composition represented by the formula:



wherein M comprises an element that can lower its free energy by chemically bonding with Z;

wherein Z comprises a chalcogen;

wherein n and p are integers greater than or equal to 1; and

wherein $0.01 < x < 0.99$; and

wherein a value for a selected material property of the nanostructured composite material comprising the nanofiller is at least 20% different from a value for the same property for an otherwise identical composite material comprising a micron-scale filler.

64. *(Currently Amended)* The nanostructured composite material of claim 63 ~~[[64]]~~, wherein the nanofiller comprises a polymer coated nanofiller.

65. *(Currently Amended)* The nanostructured composite material of claim 63 ~~[[64]]~~, wherein the nanofiller comprises a monomer coated nanofiller.

66. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the composite material comprises a coating composition.

67. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein M is selected from the group consisting of: Ti, Mn, Fe, Ni, Zn, Cu, Sr, Y, Zr, Ta, W, Sc, V, Co, In, Li, Hf, Nb, Mo, Sn, Sb, Al, Ce, Pr, Be, Np, Pa, Gd, Dy, Os, Pt, Pd, Ag, Eu, Er, Yb, Ba, Ga, Cs, Na, K, Mg, Pm, Pr, Ni, Bi, Tl, Ir, Rb, Ca, La, Ac, Re, Hg, Cd, As, Th, Nd, Th, Md, and Au.

68. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein $0.02 < x < 0.98$.

69. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein $0.05 < x < 0.95$.

70. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the domain size of the material is less than 5 times the mean free path of electrons in the material.

71. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the domain size of the material is less than 100 nanometers.

72. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the nanomaterial comprises two or more elements M that can lower their free energy by chemically bonding with Z.

73. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the nanomaterial comprises more than one element Z.

74. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the nanomaterial comprises more than one element M and more than one element Z.

75. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the nanomaterial comprises a multimetallic nanopowder having an aspect ratio in a range of 1-25.

76. (*Currently Amended*) The nanostructured composite material of claim 63 [[64]], wherein the nanomaterial comprises a polymetallic nanopowder comprising at least three metals and at least one anion, and having a minimum dimension of less than 100 nm and an aspect ratio of 25 or less.

77. (*Previously Presented*) A non-stoichiometric nanomaterial comprising two or more elements having a composition different than that required for stoichiometric bonding between the two or more elements, the composition represented by the formula:



wherein M comprises an element that can lower its free energy by chemically bonding with Z;

wherein Z comprises an element selected from the group consisting of B, C, Si, N, P, O, S, Se, Te, and H;

wherein n and p are integers greater than or equal to 1;

wherein $0 < x < 1$; and

wherein a value for a selected material property of the non-stoichiometric nanomaterial is greater than 10% different from a value for the same property for a stoichiometric form of the nanomaterial.

78. (*Previously Presented*) A nanostructured composite material comprising:
a polymer matrix; and
a nanofiller dispersed in the polymer matrix;
wherein the nanofiller comprises a non-stoichiometric nanomaterial comprising
two or more elements having a composition different than that required for
stoichiometric bonding between the two or more elements, the composition represented
by the formula:



wherein M comprises an element that can lower its free energy by
chemically bonding with Z;

wherein Z comprises an element selected from the group consisting of B,
C, Si, N, P, O, S, Se, Te, and H;

wherein n and p are integers greater than or equal to 1;

wherein $0 < x < 1$; and

wherein a value for a selected material property of the nanostructured composite
material comprising the nanofiller is at least 20% different from a value for the same
property for an otherwise identical composite material comprising a micron-scale filler.